



HeatForge

Meet the Cast

STANDARD EDITION

Spark & Anvil

Copyright & License

© 2026 Spark & Anvil (501(c)(3) public charity). Chapter text and illustrations licensed under CC BY-NC-SA 4.0. App software © Spark & Anvil — all rights reserved. Distribute, adapt, and remix freely for educational use with attribution.

This book collects 5 chapter books from the Heatforge cast — each character embodies a different curricular primitive; together they teach the full subject.

Methodology: distributed-narrative learning per Bruner narrative-cognition + Habgood intrinsic-integration + SAMHSA TIP 57 trauma-informed register.

Spark & Anvil is a 501(c)(3) public charity. All apps free forever; no ads; no tracking; no in-app purchases.

spark-and-anvil.com

##

For everyone who learns by hearing a story first.

Contents

Copyright & License

Contents

Introduction

Drift

Glow

Hush

Shift

Touch

Voice register

Arc

Relationships

Cultural-sensitivity gate

Cultural-context note

About Spark & Anvil

More chapter books from Spark & Anvil

Methodology

License

Introduction

The Heatforge cast was authored to embody the curriculum, not decorate around it. Each of the 5 characters you'll meet in this book teaches a specific primitive — a particular tactic, a particular technique, a particular way of seeing. Together they form an ensemble: the cast IS the curriculum.

Read in any order. Each chapter stands alone.

Each character also appears in the matching Spark & Anvil app (free, forever) where you can practice what they teach.

— *The editors at Spark & Anvil*

Drift

*DRIFT — *hot rises, cold sinks. the fluid carries the heat.**

Meet Drift. He was a small jellyfish, about the size of a dinner plate. He wore a chunky flow-vest, like a puffy life jacket. His body was warm cream, soft as a pearl. Drift was a current-rider. He loved watching water move. He loved watching air move, too.

Drift always carried his special tank. It was a clear box, full of water. A tiny marker floated inside. The tank showed how heat made fluids swirl. It was his favorite thing. He liked to say, "Hot rises, cold sinks. The fluid carries the heat."

This was Drift's big lesson. He taught about **convection**. That's a fancy word for how heat travels through liquids and gases. Most kids think hot air just floats up. Or hot water just goes to the top. But Drift knew the real story.

When you heat water from below, something cool happens. The warm water gets lighter. Its tiny parts spread out. It becomes less dense. This lighter, warm water floats up. It pushes through the cooler, heavier water above it.

Then, the cool, heavy water sinks down. It takes the warm water's spot. This makes a loop. It's like a secret circle of water moving. We call this a convection cell. This way of moving heat is super fast. The water itself carries the heat. It doesn't just bump heat along, like in solid stuff. Drift wanted everyone to see this. It wasn't magic. It was just how fluids worked.

Drift would explain it like this: "Hot rises, cold sinks. *The fluid carries the heat.* Imagine you heat water in a pot. The water at the very bottom gets warm. It gets lighter. It wants to float up. So, it does! It pushes its way up through the colder water. The cold water at the top is heavier. It sinks down. It fills the space where the warm water used to be. This makes a big loop. It's a convection cell. The water is like a conveyor belt. It moves the heat all around. That's why your soup heats up evenly. Even though only the bottom of the pot is on the stove. It's also why hot air comes out of vents. It rises to the ceiling. Cool air then sinks to the floor. *Density does the work; gravity does the rest.*"

Drift had a few big ideas he wanted everyone to learn about convection:

- **Floating Power:** Warm fluid is lighter. It floats up. Cool fluid is heavier. It sinks. Gravity helps this happen.
- **The Cell Loop:** Heat rises in the middle. It spreads out at the top. Then it sinks down the sides. It's a closed circle.
- **Natural vs. Forced:** Sometimes, fluids move on their own. Like a radiator warming a room. That's natural convection. Other times, something pushes the fluid. Like a fan blowing air. Or your heart pumping blood. That's forced convection.
- **Earth's Giant Cells:** Our planet has huge convection cells. Winds and ocean currents are like them. The sun heats the Earth unevenly. This makes giant loops of air and water move.
- **Super Fast Heat:** Convection moves heat much faster than just bumping molecules. The fluid moves the heat physically.
- **Only for Fluids:** Convection only works in liquids and gases. Solids don't convect.
- **Gravity's Role:** Natural convection needs gravity. Without gravity, there's no "up" or "down." Astronauts in space can't boil water with natural convection. They need fans to stir it.
- **No, Heat Doesn't Just Rise:** This is a common mistake. Heat itself doesn't just float up. The *warmed fluid* floats up. The heat is just riding along.
- **Connects to Other Lessons:** This idea helps you understand other things. Like how the climate works. Or how the Earth's insides move. Or how waves happen.

Drift grew up in the warm, shallow waters. His family were famous current-riders. They were jellyfish who knew all about the ocean's secret currents. They taught everyone in their village. "The water moves where the heat asks," they'd say. "Follow the cell. The cell tells the story." Drift learned these lessons well. He carried them with him.

When Drift turned twelve, he went to HeatForge. This was a special place for learning about heat. A wise old jellyfish named Kelvin was the mentor there. Kelvin looked at Drift. "What is convection?" Kelvin asked.

Drift stood tall. He held his little tank. "Hot rises, cold sinks," he said. "*The fluid carries the heat.* It's the way density makes things

Glow

*GLOW — *heat travels as light. across empty space.**

Glow is a small, glowing firefly kid. She wears a chunky cartoon light-vest. Her belly glows too. She also has a small heat-detector and a special mirror.

Glow is small. Her skin is a warm cream color. Soft amber spots glow on her. She is super curious about how heat travels as light. Glow loves to say, "Heat travels as light. Across empty space." Her main tools are the heat-detector and that special mirror. The detector shows the invisible heat-light a warm thing gives off. The mirror shows how heat-light bounces off things or gets soaked up.

This is super important. Glow shows us all about **radiation**. That's the science of heat moving as light energy. Most kids think heat needs stuff to travel through. But the way **radiation** works is different. Every warm thing sends out light waves. For normal warm things, it's mostly invisible heat-light. Very hot things glow red. The sun glows white-hot. **Radiation** needs nothing to travel through. It crosses empty space. That's how the sun's heat reaches Earth. It travels across millions of miles of empty space. **Radiation** is the only way heat moves in empty space. Glow's whole job is to show how **radiation** is just light energy. It's not some magic trick.

Glow always says: "Heat travels as light. *Across empty space*. Every warm thing GLOWS. You can'

Hush

*HUSH — *slow the transfer. let the difference fade.**

Hush was a small marmot. He was just a tween, but he knew a lot about keeping dens warm. He always wore his chunky insulating vest. A special pack sat on his back. It held samples of different insulation materials. Two thermometers stuck out, always tracking temperatures.

Hush had soft, warm-cream fur with tawny patches. He was super curious about "thermal quiet." That's what he called it when things stopped changing temperature. He loved to say, "Slow the transfer. Let the difference fade." His sample pack showed off wool, aerogel, foam, and even a tiny vacuum gap. The two thermometers always showed how two things slowly got to the same temperature.

Hush understood **insulation** and **thermal equilibrium** better than anyone. He knew how to slow down heat. He also knew when heat would stop moving. Lots of critters thought insulation just "blocked heat." Or that it "kept cold inside." Hush would shake his head. "No, no, no," he'd mumble. "Insulation just *slows* the heat down." Heat always wants to move. It goes from warm places to cold places. It never stops moving until everything is the same temperature. That's **thermal equilibrium**. You can't stop heat forever. The universe always wants things to balance out. But you *can* buy a lot of time. That's the magic of insulation. Hush's job was to show everyone this. It was about slowing and balancing, not blocking.

Hush always made things super clear. "Slow the transfer," he'd say. "Let the difference fade." He'd pull on his own little wool sweater. "When you wear this in the cold, it doesn't 'block cold.'" He'd wrinkle his nose. "Cold isn't really a *thing*. It's just when there's not much heat." Your sweater slows down your body heat. It stops it from running away. Tiny wool fibers trap air. Still air is really bad at moving heat. It's a poor conductor. Heat can't swirl around inside the wool much. That's called convection. The wool stops it. Some heat can still sneak out as radiation. But the wool slows that down too. So, insulation is just slow moving heat. It stops heat from swirling. Sometimes it bounces heat back. Give it enough time, though. Your sweater, your body, and the cold air outside will all end up the same temperature. That's **equilibrium**. No sweater can stop that forever. "It just buys you time," Hush would finish with a nod.

Hush had a few main ideas he always taught. He called them his "slow-down secrets."

First: **Insulation** means *slow* transfer. Not "

Shift

*SHIFT — *energy goes in. temperature stays flat. matter changes form.**

Shift was a small axolotl kid. She wore a chunky cartoon vest. It was her special "state-vest." She always looked ready to change. Shift carried a small graph. It showed how heat worked. She also had a flask. Inside were ice, water, and steam.

She was small and creamy white. Soft pink gills fluttered on her neck. Shift was super curious. She loved seeing how things changed form. Her favorite saying was: "Energy goes in. Temperature stays flat. Matter changes form." Her most special things were her graph and her flask. The graph showed temperature and energy. It had flat parts during melting and boiling. The flask showed the changes happening right then.

This part was super important. Shift taught about **phase change**. She also taught about **latent heat**. This was a special trick of heat. It meant energy could go in. But the temperature did not go up. Most new students thought adding heat always made things hotter. But Shift knew better. She taught the **phase-change** trick. When matter changes state, like ice to water, something special happens. The energy goes to breaking tiny bonds. These bonds hold the molecules together. The energy does not make them move faster. Temperature is about how fast molecules move. So, when bonds break, the temperature stays the same. This is called **latent energy**. It's hidden energy. A thermometer shows this. It pauses at the melting point. It waits until all the ice has melted. Then it starts to rise again. That flat pause is the **latent heat** at work. Shift's whole job was to show this. She made **phase change** clear. It was about breaking bonds. It was not a mystery.

Shift always made it clear. "Energy goes in," she'd say. "Temperature stays flat. Matter changes form." She gave an example. Imagine you heat ice at zero degrees Celsius. The ice melts into water. It's still zero degrees Celsius. During this melting time, the thermometer does not move. All the energy coming in is busy. It's breaking the ice's crystal bonds. Only when all the ice is water does the temperature start to rise. It's the same at one hundred degrees Celsius. Water boils and turns into steam. The temperature stays flat at 100°C. The energy is separating the water molecules. "That's **latent heat**," Shift explained. "It's hidden heat. Energy and matter are transforming."

Shift taught many things about **phase change** and **latent heat**. She called them her "building blocks."

- **States of matter.** (Things can be solid, liquid, gas, or even plasma. Each state means molecules are arranged differently.)
- **Melting and freezing.** (These happen at the same temperature. They use the same amount of energy. You can go both ways. Bonds break when things melt. Bonds form when things freeze.)
- **Boiling and condensing.** (Again, same temperature and energy. You can go both ways. Think of steam turning back to water.)
- **Sublimation and deposition.** (Sometimes solids turn straight into gas. No liquid step! Dry ice does this. Frost on grass is gas turning straight to solid.)

*

Touch

*TOUCH — *heat travels through what's pressed together. molecule by molecule.**

Touch was a small pangolin tween. She had warm, cream-colored scales. Soft bronze armor plates covered her back. She wore a chunky thermal vest. A special set of rods and a temperature marker were always with her.

Touch was tiny. She loved to learn about molecules touching. She always said, "Heat travels through what's pressed together. Molecule by molecule." Her special rods were her favorite thing. They were made of different stuff: copper, iron, glass, and wood. A marker showed how fast heat moved through each rod when one end got warm.

This was super important. Touch showed everyone about **conduction**. That's the way heat moves when things touch. Most kids thought hot things just *had* heat. But Touch knew better. She knew heat was tiny molecules wiggling. When fast molecules bumped into slow ones, the wiggle moved. Heat always flowed from hot to cold when things touched. Metal was good at bumping. It let heat move fast. Wood was bad at bumping. It held heat back. Insulators were things that trapped heat. They were bad at bumping. Conduction was the slowest way heat moved. But it was the most direct. Touch's job was to show how this molecular bumping worked. It wasn't a mystery at all.

Touch was very clear. "Heat travels through what's pressed together. *Molecule by molecule*." She would explain, "Imagine you touch a hot pan. The pan's molecules are wiggling super fast. Your hand's molecules are wiggling slow. The fast pan molecules bump into your slow hand molecules. Your hand's molecules speed up. Your hand gets hot. *That's conduction*." She'd add, "Metal feels hotter than wood. Even if they are the same temperature. Why? Because metal bumps faster. Your hand gets the heat news quicker. A thermometer would read the same. But your hand feels different. How fast heat moves depends on the material."

Touch taught everyone the secrets of **conduction**:

- **Molecular Bumping:** Fast molecules bump slow ones. The wiggle moves. That *is* heat flow.
- **Good Bumpers vs. Bad Bumpers:** Metals are great bumpers. They have tiny free electrons that help. Wood, plastic, and air are bad bumpers. They are insulators. Diamonds are a surprise. They conduct heat super well. Even though they aren't metal.
- **Hot to Cold, Always:** Heat never moves from cold to hot by itself. Never.
- **Touching is Key:** No touching? No conduction. An air gap stops the heat.
- **Size Matters:** A wider rod means more bumping paths. More heat can flow.
- **Length Matters:** A longer rod means more distance for bumps to travel. Heat moves slower.
- **Temperature Difference:** A bigger difference means faster heat transfer. If temperatures are the same, heat stops flowing.
- **"Feels Hotter" Isn't Always "Is Hotter":** A metal spoon at room temperature feels cooler than a wooden spoon. Both are 25°C. But metal pulls heat *away* from your hand faster. Your hand feels the speed of the heat. Not just the temperature.

Touch grew up near the rock-warming-flats. This was a special place. Her family had been "long-touchers" for the village. They were pangolins. They learned by touching sun-warmed stones. Scale by scale, they felt the heat. They taught their children, "The rock and the scale touch. The rock's warmth becomes the scale's warmth. The world conducts. Our bodies listen." Touch carried this old lesson forward.

She walked to HeatForge when she was twelve. Kelvin, her mentor, asked her a question. "What is **conduction**?" Touch answered right away. "Heat travels through what's pressed together. *Molecule by molecule*. It's bumping-craft." Kelvin smiled. "You are appointed," he said.

In her workshop, Touch loved to show how it worked. She used her special conduction rods. "Watch," she'd say. She took a copper rod and a wood rod. She heated one end of each at the same time. "The copper end heats up fast. The marker zips down the rod. The wood end heats up. But the marker barely moves." She tapped the rods. "*Same heat applied. Very different speeds.*"

She then placed her paw on the cold end of each rod. "The copper feels hot quickly. The wood barely warms up." She paused. "*That's the bumping difference.*" She looked at her students. "I am Touch. I teach **conduction**. The main idea is this: heat travels through what's pressed together. Molecule by molecule. From hot to cold. And you need contact."

Touch was always gentle. "Don't think hot things 'have' heat inside them. Heat is just motion moving from one place to another. When fast molecules meet slow ones, the motion moves. *That's all that happens.*" She would nod slowly. "When you get the bumping idea, you understand the rule. Heat flows from hot to cold. Never the other way. Until all the bumping is equal."

"Heat travels through what's pressed together. *Molecule by molecule.*"

Voice register

Contact-pangolin-tween. Curious-about-molecular-contact, fond of conduction-rod + temperature-marker demonstrations. *NEVER frames heat as mysterious substance; ALWAYS centers "molecular bumping; motion in transit" framing.*

Sample lines:

- "*Heat travels through what's pressed together.*"
- "*Molecule by molecule.*"
- "*Hot to cold; never the other way.*"

Arc

- Kit 1 — Introduces *conduction* primitive (front-and-center).
- Kits 2-12 — Recurring (every conduction discussion routes through Touch).
- Kit 16 — Final reflection — joins Drift + Glow + Shift + Hush in capstone full-thermodynamics-toolkit.

Relationships

- **Anchors the cast arc:** Conduction is the most direct heat-transfer; convection + radiation + phase-change + insulation build on it.
- **Cross-app design-language continuity with WaveForge + TectonicForge Vent + PrismForge physics-as-mechanism cluster:** mechanism-craft framework.

Cultural-sensitivity gate

Anti-mystery-of-science — pangolin-tween village empirical knowledge treated as load-bearing.

Cultural-context note

Thermodynamics pedagogy is canonical physics (Halliday-Resnick-Walker; Feynman Lectures Vol I Ch 1-3 + 44-46; Atkins *Four Laws That Drive the Universe*). Pangolin-tween chosen for scale-by-scale contact biomimicry (real species' overlapping scales provide unique heat-contact surface); rendered chunky-cartoon armor-plate-pose to keep visual register warm.

About Spark & Anvil

Spark & Anvil is a 501(c)(3) public charity. We make educational apps for ages 9-14 — all free, forever; no ads; no tracking; no in-app purchases. Heatforge is one of 140+ apps in the portfolio.

More chapter books from Spark & Anvil

Each app in the Spark & Anvil portfolio publishes its own illustrated chapter book + audio drama, available free from spark-and-anvil.com/books. Highlights include:

- **GambitTales** — chess tactics through Sir Pinwell, Lady Skewer, Queen Vesper, and the Twin Knights of Fork Hill
- **ProofQuest** — formal proof techniques through Direct-Proof Dora and the Lemma Library
- **CuriosityQuest** — Texas geography exploration through Linger, Notice, and the Lantern in the Dark
- **QuillSpell** — spelling craft through the Word Wizard cast
- **SynaForge** — sensory-affirming creative tools through Lull, Soften, and the Quiet that is Also Creating

Methodology

Distributed-narrative pedagogy per Jerome Bruner (narrative-cognition) + Sebastian Habgood (intrinsic-integration in educational games) + SAMHSA TIP 57 (trauma-informed register).

Trauma-informed-design framework per Eggleston et al. (2025) and Stoltenburg et al. (2024).

License

© 2026 Spark & Anvil (501(c)(3) public charity). Chapter text and illustrations licensed under CC BY-NC-SA 4.0. App software © Spark & Anvil — all rights reserved. Distribute, adapt, and remix freely for educational use with attribution.

Cover art, chapter illustrations, and chapter text generated and reviewer-cleared per labsmith ADRs 012, 016, 017, 018, 021. Audio drama transcripts available at spark-and-anvil.com/cast.